

Socio-economic and livelihood profile of ornamental fish producers in India - The DFID approach

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ABSTRACT

The present study has been done in three hotspots areas of ornamental fish production and trade in India Viz. Kolkata (West Bengal), Chennai and Mumbai. The sociometric study revealed that the ornamental fishery is a male oriented activity in all the three study locations, but it holds as primary occupation only in case of Chennai. Moreover, it has been observed that the source of information was mainly from informal sources comprising of friends and relatives. Ornamental fisheries were primarily driven by own funding in all the three locations. Furthermore, the Pentagon diagram of the DFID model shows that all the five capital assets of Chennai are proportionately networked which is not such case of Kolkata (West Bengal) and Mumbai which revealed that the activity was more organized and coordinated in Chennai as compared to other two locations.

Keywords: Socio-economic, livelihood, ornamental fish, opportunities, producer, employment

Fisheries technologies can be broadly classified into livelihood options which requires very little capital investment and ensures supplementary income for

primary stakeholders, intermediate technologies that require limited capital and correspondingly delivers larger gross incomes, the management of which require keen value chain supervision and, commercial technologies that are accompanied by demands for capital investment and professional management of value chain to ensure substantial and sustained levels of higher income (Krishnan and Narayankumar, 2010). The fisheries sector contributes to the livelihood of a large section of the economically underprivileged population in India (Ayyappan and Krishnan, 2004).

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Further, the prospects of ornamental fisheries have been emerging substantially as a lucrative horizontally integrated commercial aquaculture venture. Indeed, the ornamental fish keeping which started as a hobby across the world, owing to its burgeoning demand in national and international markets, has turned out to be a commercially traded commodity in different parts of the world (Ukaonu *et al.* 2011). It has been estimated that over 1.5 million people are engaged in this sector, and over 3.5 million hobbyists constitute the trade in the world (Dey, 2010). The sector has been recognized for its ability to generate employment opportunities, alleviating poverty and contributing to the growth of national income by enhancing foreign exchange earnings. With the phenomenal increase in the demand of ornamental fishes worldwide, more countries have realized the economic potential of this sector and intervened directly to promote its development (Lee, 2005). The estimated worth of the international ornamental fish trade at retail prices is estimated to be more than US\$ 8 billion while the entire sector including aquarium tanks, plants, accessories, feed, medicines, etc. is estimated at US\$ 20 billion (Swain *et al.* 2010). India's overall domestic trade in ornamental fish is expected to be nearly INR 15 crores or INR 150 million (Kurup *et al.* 2012) and the activities are mostly concentrated in states of West Bengal, Maharashtra, Tamil Nadu and Kerala (Nair, 2012). At present, Kolkata, Chennai, Kerala and Mumbai are the hot spots of ornamental fish trading in India and have attracted many market hubs in the country (Mahapatra *et al.* 2000; Ghosh *et al.* 2003; Ponniah *et al.* 2008; Ambilikumar and Mercy, 2012 and Nair, 2012).

Ornamental fish culture has made a paradigm shift among entrepreneurs ushering in economic development. Production of animals for the aquarium hobbyist trade is a rapidly growing sector of the aquaculture industry, and it will continue to become more important as restrictions are placed on collecting animals from the wild (Tlusty, 2001). It is quite evident that the global ornamental fish industry has been growing steadily over the years, and an increasing number of entrepreneurs are becoming interested in the trade (Gurumayum and Goswami, 2002). Moreover, the ornamental fish trade is a booming business across the

globe, and the ancillary activities associated with the sector such as supplementary feed, medications and manufacturing of chemicals and providing aquarium support services provides opportunities of business for breeders, farmers, aquarists and other people (Itzkovich, 2011).

In India, despite many initiatives by the government, the ornamental fisheries remains highly unorganized, and this results in extended marketing channels which cause marginalization of the producer. Therefore, it is important to understand the current livelihood patterns of the people involved in this sector. Livelihood does not only mean the activities that people carry out to earn a living but also the different elements that contribute to or affect their ability to ensure a living for themselves and their household which includes the assets that enable them to gain access to human, natural, social, financial, physical capital and its use to satisfy basic needs (Messer and Townsley, 2003).

METHODOLOGY

The present study adopts the sustainable livelihoods framework of Department for International Development (DFID, 2000) to assess the capital assets of the ornamental fish producers and traders in the selected three major ornamental fish hotspots of India *Viz.*, Kolkata (West Bengal), Mumbai and Kolathur (Chennai, Tamil Nadu). The data were collected through key informants including scientists and experts from fisheries department, private entrepreneurs, cooperative societies members, traders, and NGOs. A semi-structured interview schedule served as the major tool and means for collection of primary data. Secondary data from different sources such as fisheries department, ICAR fisheries research institutes, MPEDA served as primary sources of information to enlighten the primary data. The sociometric data were tabulated and analyzed using mean and percentage analysis (Devi, 2014). Based on DFID (2000) rapid and participatory methods were used to collect the primary data on the five capital assets (Physical, Social, Human, Finance and Natural). Each capital asset has a number of indicators which defined the particular capital asset (Table 1). The process of data collection for livelihood analysis is depicted in Figure 1.

A weight of 45 for *very good*, 30 for *right*, 15 for *moderate*, 08 for *poor* and 02 for *severe* based on the relative

availability, accessibility and importance of the assets in the study locations were assigned (Sreedevi, 2005).

Table 1: Indicators defined under each capital asset

S.No.	Capital Asset	Indicators
1	Financial (6)	i. Own fund ii. Friends and relatives, iii) Money lenders, iv) Credit cooperative societies, v) Banks/institutional finance, vi) Advances from traders
2	Human (5)	i. Educational status, ii) Technical knowledge in ornamental fish (OF) breeding and rearing, iii) Training and extension services, iv) Skilled labor, v) Casual labor
3	Physical (9)	i. Fish breeding and rearing units, ii) Transport facility, iii) Equipment, iv) Water supply, v) Energy, vi) Packaging facility, vii) Market infrastructure, viii) Education facility, ix) Health services
4	Natural (5)	i. Land (owned/rented/leased), ii) Livefeed availability, iii) Open access to natural water bodies, iv) Climatic condition, v) Indigenous Traditional Knowledge
5	Social (4)	i. Relationships with relatives and neighbours, ii) SHGs and Cooperative societies, iii) Networking with traders, ii. iv) local farmers organization

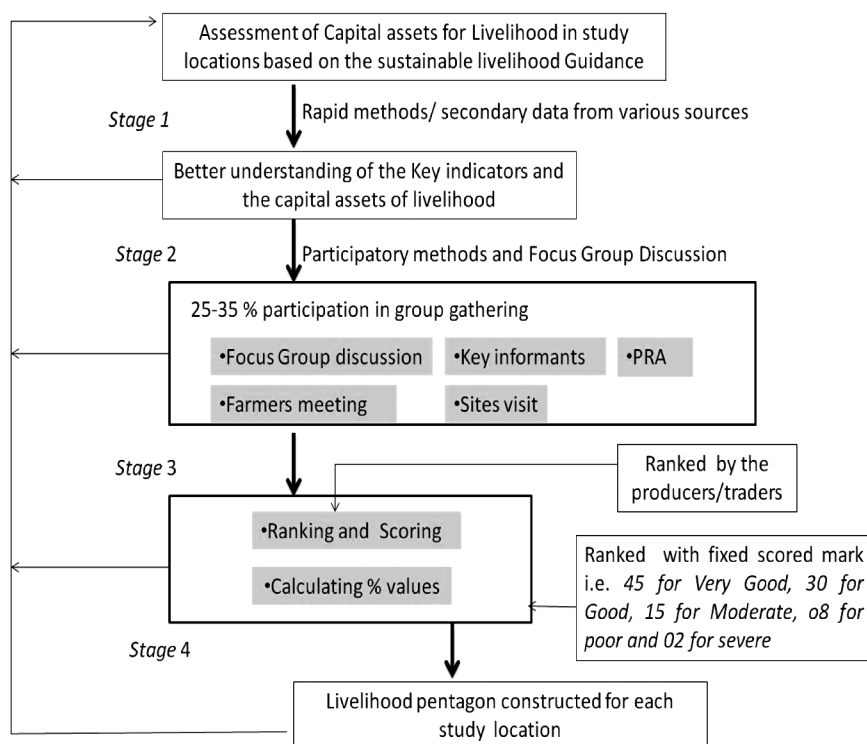


Fig.1: Flow diagram indicating process of livelihood analysis (Adapted from Sreedevi, 2005)

RESULTS AND DISCUSSION

Socio-economic status of the ornamental fish producers and traders

Socio-metric analysis includes parameters like age, gender, marital status, type of family, literacy level, number of family members involved in the ornamental fisheries, experience, occupation, income level and sources of information and credit. It can be seen from Table 2 that the ornamental fisheries is a male oriented activity and substantial involvement of females in the ornamental fisheries activity is more as far as Kolkata is concerned while it is practically nil in the other two locations. The analysis of gender composition in the study area revealed that 94% of the respondents in Mumbai and 96% of respondents in Chennai comprised of males and rest females. Conversely, compared with Mumbai and Chennai about 38% of the interviewees in Kolkata were women and rest men. This is basically because ornamental fisheries are structured around Self Help Groups and Cooperatives in which the presence of women is predominant in Kolkata. Moreover, ornamental fishing in Kolkata is still a traditional activity; the production centers are located in the backyards of households of the women members of the SHGs and cooperatives. Owing to the proximity of *Kolathur*, Chennai to the capital city of the state and the level of education being relatively higher, women are engaged in other activities other than ornamental fisheries owing to which this enterprise is a male oriented or a male dominated activity in Chennai. The small proportion of women in ornamental fisheries activities in Mumbai can also be viewed from the angle of availability of alternative employment to women and the need for quick response time to enable the ornamental fisheries to happen it a male dominated activity.

The mean age group of people engaged in ornamental fisheries lay between 41-50 years in all the three study locations. Among the respondents almost all of them were married but it may be noted that in Kolkata 14 respondents were unmarried. This may be attributed to the responsibilities that weigh down the stakeholders owing to the general prevalence of poverty and larger size of the family in Kolkata. While nuclear families were predominant in Chennai and Mumbai, it was joint families that were dominating in Kolkata. This may be

attributed to the more income earning opportunities in Chennai and Mumbai as compared to Kolkata. The need for remaining in a joint family and the requirement for pooling of monetary resources may be seen as the factors behind the prevalence of joint family system in Kolkata.

Ornamental fisheries enjoyed an almost uniform level of literacy among the producers and traders who are the respondents of this survey. The survey indicated that the highest numbers of the illiterate respondents were observed in Kolkata (about 10%), followed by Chennai (2%). Similarly, highest percentage (about 43%) of the respondents reached primary education level in Kolkata followed by Chennai (20%). However, 75% of the respondents in Mumbai have reached higher secondary and above, followed by 44% of the respondents in Chennai and about 23% in Kolkata (Table 2). While formally educated graduates were high in Mumbai, it was the higher secondary level educated entrepreneurs who dominated the production and trade in ornamental fisheries in Mumbai and Chennai. The predominance of primary level skilled operators could be seen only in Kolkata. Ornamental fisheries are multi- family members activity while it can be seen that almost all respondents and at least one other member of the family were engaged in the production and trade related to ornamental fisheries, it is not uncommon that 3-4 members of the family were also involved in the same work. Compared with other study areas, Kolkata can be seen to be having the highest number of participating family members i.e. more than three which can be correlated with a maximum number of joint families (about 74%) in the same area. The growth of ornamental fisheries and trade has a direct relationship with experience with as much as 45% of the respondents in Kolkata and 40% in Mumbai were in this business for 11-20 years. While in Chennai 44% of the entrepreneurs had 6-10 years of experience. It is also interesting to note that almost all the respondents in Chennai were engaged in ornamental fisheries as a primary occupation while it was 64% in Kolkata and 70% in Mumbai. The focus level of 98% engaged in ornamental fisheries activity in Chennai could be attributed to the professionalism of the operators engaged in this activity. They have been able to raise the standards of supply chain both

Table 2: Socio-metric analysis of beneficiaries' involved in ornamental fisheries activity in three locations of India

Category	Kolkata (n=50)		Chennai (n=50)		Mumbai (n=50)	
	Number	%	Number	%	Number	%
Male	56	62.22	48	96.00	47	94.00
Female	34	37.78	2	4.00	3	6.00
Age group						
Below 30 years	9	10.00	6	12.00	5	10.00
31-40 years	24	26.67	16	32.00	21	42.00
41-50 years	41	45.56	18	36.00	18	36.00
>50 years old	16	17.78	10	20.00	6	12.00
Marital status						
Married	76	84.44	49	98.00	48	96.00
Un married	14	15.56	1	2.00	2	4.00
Type of family						
Nuclear	23	25.56	45	90.00	46	92.00
Joint	67	74.44	5	10.00	4	8.00
Literacy level						
Illiterate	9	10.00	1	2.00	0	0.00
Primary	39	43.33	10	20.00	0	0.00
High school	21	23.33	17	34.00	12	24.00
Higher Secondary	11	12.22	12	24.00	23	46.00
Graduates	8	8.89	6	12.00	9	18.00
Post Graduates	2	2.22	4	8.00	6	12.00
Number of family members involved						
1 to 2	26	28.89	39	78.00	43	86.00
3 to 4	7	7.78	10	20.00	5	10.00
More than 4	57	63.33	1	2.00	2	4.00
Years of experience						
Less than 5 years	6	6.67	6	12.00	4	8.00
6-10 years	27	30.00	22	44.00	18	36.00
11 - 20 years	40	44.44	14	28.00	20	40.00
>20 years	17	18.89	8	16.00	8	16.00
Occupation						
Primary	58	64.44	49	98.00	35	70.00
Secondary	32	35.56	1	2.00	15	30.00
Income levels (₹ per month)						
< 5000	29	32.22	3	6.00	2	4.00
5000-10000	33	36.67	19	38.00	10	20.00
10000-15000	18	20.00	23	46.00	25	50.00
> 15000	10	11.11	5	10.00	13	26.00
Source of information						
Department of Fisheries	19	21.11	3	6.00	2	4.00
Institutional agencies like MPEDA/NFDB	14	15.56	6	12.00	5	10.00
Media support (Print/ Visual /Audio)	4	4.44	8	16.00	10	20.00
NGO/cooperatives involvement	22	24.44	3	6.00	2	4.00
Friends and relatives	31	34.44	30	60.00	31	62.00
Source of the credit						
Co-operative society	14	15.56	3	6.00	0	0.00
Banks	11	12.22	2	4.00	2	4.00
Own fund	9	10.00	23	46.00	29	58.00
Credit from SHGs	31	34.44	5	10.00	0	0.00
Friends/Relative/Neighbour	3	3.33	3	6.00	12	24.00
Money lenders	22	24.44	14	28.00	7	14.00

Table 3: Capital assets and indicators of livelihood status of the ornamental fisheries activity in different locations of India (in %).

Key Indicators	West Bengal (%)	Chennai (%)	Mumbai (%)
Financial Capital			
Own Fund	14.73	29.82	39.23
Friends and relatives	10.62	10.23	19.17
Moneylenders	21.88	17.30	20.93
Credit Cooperatives societies	31.66	13.25	8.46
Banks	17.38	24.40	7.41
Advances from OF traders	3.73	5.00	4.80
Overall %	17.14	13.21	15.61
Human Capital			
Education status	17.28	32.36	34.27
Technical Knowledge in OF production	17.28	20.40	21.17
Training and Extension services	22.08	18.29	9.27
Skill labour	26.99	18.29	23.19
Casual Labour	16.36	10.65	12.10
Overall %	18.52	20.36	24.31
Physical Capital			
Fish breeding and rearing units	13.38	12.31	9.92
Transport facility	8.51	10.00	14.46
Equipment	11.71	8.46	10.74
Water supply	15.61	8.46	5.79
Energy	6.17	9.23	11.57
Packaging facility	9.59	11.92	10.74
Market infrastructure	8.81	11.15	8.26
Educational facility	12.83	15.38	14.88
Health services	13.38	13.08	13.64
Overall %	15.09	20.69	32.94
Natural Capital			
Land (owned/ rented/leased)	20.70	21.96	17.50
Livestock availability	26.23	24.02	21.20
Open access to swamp areas, rivers etc	22.36	20.97	15.55
Climatic Condition	17.60	22.49	36.37
Indigenous Traditional Knowledge (ITK)	13.11	10.56	9.38
Overall %	23.10	18.88	6.07
Social Capital			
Information networking with Relatives/ neighbours	26.09	37.33	25.48
Self Help Group/ Cooperatives	31.16	17.33	14.73
Networking of traders	26.81	26.00	43.60
Networking of institutions	15.94	19.33	16.18
Overall %	26.13	26.86	21.07

for production and marketing to such an extent that ornamental fishery provided them with all the income that they required and hence their concentration was on the same activity which enabled them to make it practically their only occupation. The secondary occupation in Mumbai is mainly pet shops. However, in Kolkata carpentry, tailoring, handlooms manufacturing, pottery are mostly their secondary profession.

Fifty %, 46% and 20% of the entrepreneurs engaged in ornamental fisheries earned an income of INR 10,000 - 15,000 a month in Mumbai, Chennai and Kolkata respectively. The statement offered by the respondents in respect of income earned per month seems to be understated as subsequent discussion in this work (Devi, 2014) revealed that based on the number of active ornamental fisheries units, total volume of trade in given period of time, the average price of fishes which are sold locally as well as to interstate markets revealed a much larger volume of output from this activity. Nevertheless, it can be seen that the informal sources of information offered the maximum extension support in ornamental fisheries in the three selected locations. Networking among friends and relatives offered as much as 62%, 60% and 34% of information required by the entrepreneurs engaged in ornamental fisheries. This is followed by media support (except Kolkata) and institutions like MPEDA, NFDB, etc. However, the prominent role of NGOs and Directorate of Fisheries (DoF) in collaboration with BENFISH in disseminating information is only noticed in Kolkata.

An examination of the sources of credit which supports the ornamental fisheries in the three locations reveals that this activity is primarily funded by own capital. Institutional finance appears to be involved to a greater extent in Kolkata but not in other locations. Cooperatives and credit from SHGs played a reasonably good role in supporting this enterprise at the Kolkata hub. It may also be noted that the commercial banks in Chennai support the activity to the extent of 28% while in case of Mumbai there is practically no role of institutional finance in ornamental fisheries. An inter-connect may be observed across sources of information and credit. Governments schemes and extension services and institutional credit appeared to be servicing the ornamental fisheries in

Kolkata but less so in the other two locations. It may be noted that despite the support, the level of activity in terms of total income generated is limited in Kolkata as compared to the other two locations since ornamental fisheries is still looked upon as a livelihood enterprise in Kolkata while it is getting transformed as a commercial venture in other two locations.

Livelihoods status of the respondent producers

In Kolkata, the cooperative credit societies support the enterprise to the extent of 32% of the financial capital that is required by the enterprise. Again in Chennai and Mumbai the operators are able to support the enterprise with own capital to the extent of 30% and 39%, respectively. Owing to the long standing nature of the enterprise the proportion of financial capital that supports ornamental fisheries in Kolkata may be related to the cooperative credit societies supporting this enterprise. This indicates, though the ornamental fisheries is a long standing enterprise in Kolkata the same has not had the opportunities of up scaling when compared to the performance of ornamental fisheries in the other two locations of Chennai and Mumbai where commercial level production has enabled generation of funds that supports the enterprise without much reliance on other sources of finance.

In the case of human capital 27% of the expertise is supported by skilled labour in case of ornamental fisheries as a livelihood enterprise in Kolkata. Skilled labour is followed by training and extension services to the extent of 22%. In case of Chennai and Mumbai it is the level of education that has enabled the ornamental fisheries to attain a level of efficiency in production and trade. Thirty two % and 34% respectively of the indicators describing human capital is captured by the level of education in these two locations, respectively. This again reinforces the fact that though experienced human resources played a major role in ornamental fisheries production and trade, it is the formally educated group of human resources that supports this enterprise in Chennai and Mumbai respectively. Another implication of this is that the Kolkata production facilities and marketing channels are traditional in nature and has a livelihood orientation while in the case

of Chennai and Mumbai, the enterprise appears to be supported by technically empowered manpower. This implication in respect of human capital is also reflected in the pentagon framework (Figure 2).

As far as physical capital is concerned the contribution of the indicators that support ornamental fisheries as a livelihood/ commercial enterprise appears to be having almost equal importance when examined in percentage terms. The single highest contribution in terms of physical capital in Kolkata is made by the availability of good water supply (16%) while in the case of Chennai the availability of educational facility (15%) and in case of Mumbai both education (15%) and transportation facility (40%) played a lead role. The overall contribution of indicators of physical capital across the three locations appeared to be uniform. But the number of units across which the physical capital is spread appears to be thin in case of Kolkata and much better in case of Chennai and Mumbai respectively. From the point of view of the constraints it can be seen that energy is a major issue in its contribution to the livelihood of the ornamental fisheries in Kolkata. The producers expend the large proportion of their funds on energy while the same problem appears to be a major constraint in case of Chennai also, while it is less so in case of Mumbai.

As far as natural capital is concerned 22% of the support for the ornamental fisheries as a livelihood enterprise may be attributed to the availability of live feed. This indicator is supplemented by open access to swampy areas and rivers which make the second largest contribution to this enterprise. It may be noted that in case of contribution of live feed as a primary indicator of supporting ornamental fisheries as a livelihood, it plays a major role in case of Kolkata and Chennai while in the case of Mumbai it plays only a minor role. This is indicated by the average score obtained by the indicator in the three respective locations.

Information networking with relatives and neighbors also appears to be playing a major role across the three locations to support ornamental fisheries as a livelihood enterprise. Similar is the case with trader networking which also plays a major role as an important social capital in promotion and sustainability of ornamental fisheries as livelihood in the three locations.

As far as the performance of different forms of capital that supports ornamental fisheries as a livelihood enterprise, it may be noted that social capital ranks first followed by natural capital, human capital, financial capital and physical capital in Kolkata. The relative strengths of Kolkata as prime location for ornamental fisheries are available in the ranks on the basis of which the types of capital have been ordered. Since ornamental fisheries are an age old avocation, it is only but natural that the location is strong on social capital. The networks of traders, the information networks and existence of the cooperatives and SHGs are strong in a tradition bound business activity and livelihoods in Kolkata. The availability of different components under natural capital in Kolkata also enhances its status as a location with unique natural advantages in respect of natural capital. Prime factors such as availability of livefeed, swamp areas and rivers including flow of natural stocks from North-eastern states enhance the potential of Kolkata as prime location for ornamental fisheries as a livelihood or commercial operation. Similarly the long standing nature of the enterprise in Kolkata has contributed a great deal to the enhancement of skilled human resources which are essential components of ornamental fisheries. Financial capital as well as physical capital also supports the livelihood status of the ornamental fisheries in Kolkata.

Similar to Kolkata, the contribution of social capital plays the most important role in the organization and structure of ornamental fisheries as a livelihood operation as well as a commercial enterprise in Chennai. Going by the long standing nature of the enterprise as well as the compact nature of the location of ornamental fisheries as a livelihood/ commercial enterprise is sustained by the various types of networking and relationship that constitute social capital. Again it is both human and physical capital that supports ornamental fisheries in its prime role as a well orchestrated-commercial enterprise in Chennai. A constituent of both physical and human capital have been born over a long period of time during which this enterprise has built its strong foundation in Kolathur, Chennai.

Natural capital also contributes substantially and closely to the total performance of ornamental fisheries

as a livelihood/ commercial operations in this particular location. It is of prime importance and interest to note that the backlog of the success of ornamental fisheries in Kolathur area of Chennai lies in the easy availability of live feed. This has a very important and positive role in determining low cost operations for ornamentals in this locality. Financial capital also plays an important role in Kolathur, Chennai. Though the contribution of own capital is high, the availability of institutional finance owing to proximity of the location to the capital city provides adequate advantages.

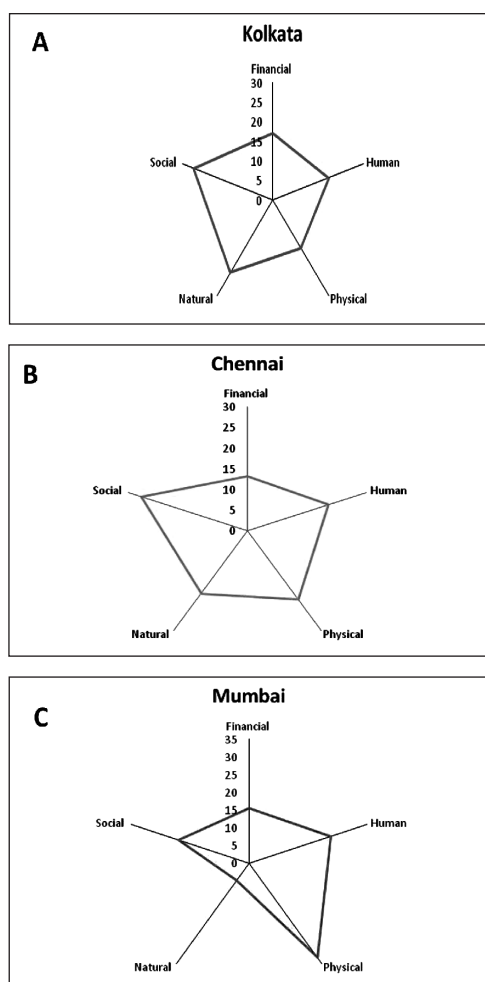
In the case of Mumbai the well entrenched and commercial nature of the enterprise is reflected in the fact that own capital funds provide the basis for the development of the forward and backward linkages which enable the growth of ornamental fisheries sector as a livelihood as well as a commercial enterprise. The unique indicator of skilled labor which supports the sector by as far as 23% implies that it is complementary to the role played by education status as well as technical knowledge in ornamental fish breeding and rearing. Intense networking both in terms of production supply chain as well as after sale services in Mumbai city plays a significant role in the healthy growth of the ornamental fisheries sector in the city. The even distribution of the role of different indicators of the physical capital in the process of lending support to ornamental fisheries as a livelihood/ commercial activity in the city of Mumbai lends credence to the fact that the activity is becoming more and more well networked economic enterprise in the city. The role of transportation and education leads in terms of percentage contribution, well supported by other components in the development of ornamental fisheries as growth sector. It may be noted that Mumbai in addition to being a regional hub in western India for maintaining the supply chain for the domestic market also has a well developed and well networked export segment of ornamental fisheries which supplement and complement the physical capital establishment for ornamental fisheries development in this region of India. The role of natural capital in supporting ornamental fisheries as a livelihood/ commercial activity is limited basically because of the fact that the Mumbai city is a densely populated urban conglomerate where land is the most premium resource and portable water no less

so. Therefore ornamental fisheries as a livelihood as well as commercial enterprise in Mumbai city largely depends on economies of scale brought to bear on the enterprise by a wide network of factors that govern the supply chain system from the point of view of both production and marketing. The role of social capital in the development of ornamental fisheries as a livelihood/ commercial enterprise in Mumbai city is more or less similar to the pattern that is available in the other locations of Kolkata and Chennai.

On the whole the role of social capital as an important indicator of the performance of ornamental fisheries activity as a growth sector of great potential is limited by the commercial aspects and does not relate to the instinctive community oriented inherent knowledge base social and information networking which is the hallmark of this activity in other two locations.

The Pentagon format (Fig. 2) of the livelihood frameworks derives its numbers from Table 3 and each of the segments of the pentagon describes the various forms of capitals that depict the DFID Model for capturing the livelihood capital. It represents the lay of different types of capital which enable the livelihood to happen in the particular locations. The distance from the point of origin represents the relative importance of various forms of capital involved in the livelihood framework in that particular location. In case of Kolkata Figure 2 (A), it can be seen from the figure that the availability of physical capital and human capital and financial capital in relation to availability of social and natural capital has close proximity to the origin which indicates that the availability, access and environment of these three types of capital is relatively less in comparison to other two types of capital, social and natural. This can be attributed to the fact that ornamental fisheries activity has been a traditional homestead occupation in Kolkata basically because Kolkata is the marketing hub for all ornamental fishes that come from the eastern and North-eastern part of the country. Figure 2 (B) gives the layout of the different proportions in which the required forms of capital are available to ornamental fisheries activity in Chennai. The pentagon format of the layout of the different forms of capital makes it obvious that ornamental fisheries activity is a location centric activity

in Chennai. The figure also indicates the almost equi-proportional availability of different forms of capital for breeding, rearing and trade of ornamental fish indicating a strong networking of this livelihood activity in Kolathur, Chennai. The networking in this livelihood activity in Kolathur, Chennai is so well connected that the time, money and physical value of capital is most optimally utilized because of the availability of the capital in close proximity which results in minimization of the cost of production.



In Figure 2 (C) it can be seen that natural capital, financial capital and social capital relatively play a lesser role in the organization and the conduct of ornamental fisheries activity in Mumbai compared to greater role played by human and physical capital. This may be attributed to the development of a market for ornamental fisheries in Mumbai in the recent times rather than being a traditional

livelihood in this commercial city. The reason for lower importance of financial capital may be attributed to the fact that ornamental fisheries activity as a livelihood is derived business of the various business houses which have diversified into this activity and are in a position to generate their own financial resources to enable successful operation of this activity. It can also be seen from the figure that the availability of natural capital in Mumbai is relatively very limited in comparison to human and physical capital. The same figure also shows the availability of human and physical capital in greater proportion compared to the other forms of capital. Recent demands on the trade have placed a premium on technical manpower and also physical infrastructure that go into the development of scaling up of ornamental fish breeding culture and trade in Mumbai. This has basically resulted from the importance given by various departments like the Department of Fisheries, MPEDA, the research institutions as well as other development organizations. The innovative and commercial business end of ornamental fisheries has also resulted in increased volume of after sales service as well as accessories trade.

CONCLUSION

The socio-metric analysis helps us to conclude that intense networking of information through informal channel, employment of own funds, family participation in the activity and favorable aged groups engaged in ornamental fisheries reveals the magnitude and scope of this enterprise to serve as a livelihood activity which in turn could be scaled up to a commercial venture. Moreover, the analysis of livelihood capital and their indicators signifying the livelihood status of ornamental fisheries in three important locations of India clearly indicates the role of each of the capital assets in a contemporary framework. The result indicates that the Kolkata market is traditional both in production as well as marketing segments, while in Chennai, the enterprise can be viewed as a livelihood as well as commercial activity and amply supported by various capital assets, in case of Mumbai the capital assets seem to be derived, resulting from locational advantages essentially demand driven. The pentagon format of the livelihood framework in ornamental fish production and trade clearly indicates the relative importance and

roles played by the different forms of capital in enabling this form of livelihood in these hotspots of ornamental fisheries activity in India. This descriptive analysis also indicates the relative strengths and weaknesses that govern this livelihood framework in the three locations. On the one hand, a traditional, low level networking livelihood pattern in Kolkata, and relatively more recent and commercial orientation in Mumbai and a traditional cum hi-technology orientation in this livelihood in Chennai. Agencies like Marine Product export Development Authority (MPEDA), National Fisheries Development Board (NFDB), National Cooperative Development Cooperation (NCDC) and National Bank of Agricultural and Rural Development (NABARD) are taking keen interest in promoting the development and culture of ornamental fishes and so far various activities are being taken up in different regions of the country where the prospects of ornamental fisheries are high. Encouragement of the producers, fish collectors, entrepreneurs and other stakeholders of the ornamental fisheries sector through different governmental agencies may help to bring up new possibilities to reach the level comparable to other advanced exporting countries in the near future.

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